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USSR Report

MACHINE TOOLS AND METALWORKING EQUIPMENT

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USSR REPORT

MACHINE TOOLS AND METALWORKING EQUIPMENT

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INDUSTRY PLANNING AND ECONOMICS

POLITBURO APPROVES CREATION OF MACHINE BUILDING BUREAU

Moscow PRAVDA in Russian 18 Oct 85 p 1

[Article: "In the Politburo of the CPSU Central Committee"]

[Text] The Politburo of the CPSU Central Committee, in the implementation of the decrees of the October (1985) Plenum of the Central Committee, determined at the regular meeting the order of discussion, propoganda and clarification of plans for the new editions of the CPSU program, changes in the party statutes and basic directions for the economic and social development of the USSR in 1986-1990 and the period up to 2000.

It was stressed that all measures on the clarification and the propaganda of these most important political documents must be of a specific and business-like nature, be well organized and full of interest, not for show and hue and cry, with the active participation of party and nonparty people. It is suggested that party committees pose at the center of attention questions of developing economics, intensifying production, accelerating scientific technological progress, strengthening thrift, raising discipline, radically improving the style of work and of the ideological-political and moral training of people.

Labor collective efforts must be concentrated on the absolute fulfillment of state plans and socialist obligations for 1985; the mobilization of all available reserves in order to provide a disciplined and energetic entrance into the new, 12th Five-Year Plan period and a worthy reception for the 27th party congress. The discussion and clarification of precongress documents must facilitate the further rallying of the Soviet people around the party, and the deep understanding by workers of the problems and prospects of improving all facets of life in a socialist society.

The decree of CPSU Central Committee and the USSR Council of Ministers on measures for improving the management of machinebuilding sectors was adopted. This decree was developed in accordance with the instructions of the April (1985) Plenum of the CPSU Central Committee on questions of improving the management of the national economy, specifies the formation of the USSR Council of Ministers Machinebuilding Bureau as a permanently acting state body.

The most important problems of the bureau are: implementation of the management of the machinebuilding complex, an increase in the coordination level of the work of machinebuilding sectors, the transformation of machinebuilding production into a highly developed base for technical progress, the carrying out of a single scientific technological policy and further development of cooperation in the area of machinebuilding with CEMA members. The USSR Council of Ministers Machinebuilding Bureau is given the right within its jurisdiction to adopt state orders compulsory for execution by ministries and departments, to review plans for annual and five-year plan periods, redistribute material resources needed for the implementation of planned tasks in an established order.

The Politburo approved the measures for increasing the economic responsibility of the industrial ministries, supply organizations, associations and enterprises for the unfulfillment of supply plans, and of transportation organizations -- for transportation plans. These measures are directed toward the establishment of stricter order in the interrelationships between suppliers and consumers of products, strengthening penalties for violation of contracts and the use of products not for the purpose intended.

Having discussed the question on the further development of subsidiary agricultural farms of industrial enterprises and organizations, the Politburo supported proposals directed toward providing this category of farms with material and equipment resources, seeds, plants and young stock. The proposal of the USSR Council of Ministers of adopting an examplary statute on subsidiary farms was approved.

The Politburo reviewed and approved the results of negotiations of M. S. Gorbachev, General Secretary of the CPSU Central Committee with M. al-Qadhafi, leader of the Libyan revolution. The extensive exchange of opinions on international problems and mutual relations confirmed that there were considerable possibilities for expanding the many-sided Soviet-Libyan cooperation, based on principles of equality, mutual benefit and respect.

Documents signed in the process of the visit, including a long range program for developing economic, scientific technological and commercial collaboration will serve as a solid basis for further strenghening friendly relations between the USSR and Libya, satisfying the interests of both countries and the interests of Soviet-Arab friendship.

The information of Comrade A. A. Gromyko on the discussion held in the USSR Supreme Soviet with delegates from the Japanese parliament and the delegates of the Luxemburg Chamber was approved.

The Politburo of CPSU Central Committee reviewed several other questions of economic policy, and relations with countries abroad, and adopted corresponding decisions.

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INDUSTRY PLANNING AND ECONOMICS

EMPHASIS ON QUALITY, SOPHISTICATION IN NEXT 5-YEAR PLAN

Moscow PRAVDA in Russian 15 Oct 85 p 1

[Article: "Machine Tool Building Must be Developed Faster"]

[Text] Soviet machinebuilding is at a turning point. To become a reliable basis for the reequipment of the entire national economy, as stressed at the June Conference of the CPSU Central Committee, it is necessary to achieve powerful uplift of machinebuilding on the basis of new equipment and technology.

The solution of this most important problem depends primarily on machinebuilders whose hands hold the levers for the renovation of machinebuilding plants and, therefore, of the entire national economy. Precisely, they are being called upon to give rapidly to machinebuilding enterprises the latest high productivity and reliable equipment which will make it possible to make the equipment second to none and better than best specimens in the world.

The machinebuilding rates in the new five-year plan period must be considerably better than those achieved heretofore. In the 12th Five Year Plan period, the sectors must more than double the output of NC machine tools, increase the output of machining centers five-fold and meet fully their requirements in the national economy. The output of flexible modules will increase 2.3-fold, flexible production systems -- 5.3-fold, and automatic and semiautomatic machine tool lines -- by 43 percent. The output of modern tools to equip this equipment will increase sharply.

Can our machinebuilders assimilate and develop the production of a large number of most complicated machines and equipment rapidly? Without a doubt. The experience of the sector's leaders convinces us of this. These are such associations as the Moscow -- for manufacturing automatic lines and machine tools and the "Krasnyy proletariy," the Ivanovsk, Kiev and Ryazan machine tool building plants, the Voronezh Heavy Mechanical Presses Plant, the Tiraspol Casting Machines Plant, etc. Their experience should be used by all collectives. This should become one of the main concerns of the sector's headquarters, managers and party organizations.

Machine tool building itself should be reequipped technically and technologically to rise to a qualitatively new level.

Large capital investments were allotted by the state to the development of machine tool building. The sector's headquarters should manage them efficiently and purposefully. A large part of the money is directed toward reequipping and modernizing the existing enterprises. Here it is important not to scatter the capital investments and to concentrate them in the comprehensive reequipment of those enterprises that are directed toward developing the output of the most modern equipment. On their side, the building ministries must accelerate the reequipment of machine tool building enterprises.

It was stressed at the CPSU Central Committee conference on accelerating scientific technological progress that many projects still contain inefficient technological solutions. This is impermissible. The projects must be targeted so that renovated enterprises manufacture only the most modern machine tools and use only the latest resource-saving and low-waste technologies. Design organization managers and party committees must increase demands of the quality of project solutions and raise the responsibility of specialists for the level of work. Customer enterprises must not, in their turn, approve solutions proposed by designers formally as still occurs, but must participate actively in the search for optimal versions of reequipment.

There are still many shortcomings in this matter. Dozens of plants in the sector are still modernizing on projects which were approved many years ago. The attitude that modernization is secondary to new construction has still not been overcome. Let us say the "GiproNIImash" designed a good plant for the production of products from metallurgical powders with comprehensive automation. At the same time, the same institute proposed an outdated solution for the expansion of the Gomel "Gidroprivod" Plant. Experience shows that modernization of enterprises is rapid and has good results when reequipment plans are comprehensive. This must become an absolute requirement. Machinebuilders need high quality, reliable machine tools and tools with low material consumption. So far, the quality and reliability of many tools do not meet modern requirements. Thus, last year the USSR Gosstandardt applied penalties to dozens of the Minstankoprom enterprises for manufacturing products not meeting GOST and specifications. There are many consumer complaints about the quality of the output of the following machine tool building plants: Sterlitamak imeni Lenin and Vilnyus "Kommunaras" plants, the Tbilissi Machinebuilding and the Ivano -Frankovsk "Karpatpressmash," "Usmansk" Casting Equipment Plant and the Lyudinovsk Aggregate Machine associations.

The sector as a whole is fulfilling planned goals for 1985. However, there are many delays, including in the output of forge-press machines, special machine tools, woodworking and casting equipment, and metalworking tools. Over 140 enterprises and the sector as a whole have not met their delivery obligations fully. Many collectives lag chronically, among them the Melitopol Machine Tool Plant, the Pinsk Forge-Press and Casting equipment plants, and the Azov Forge-Press Automatic Machines Plant. Party organizations and managers of these enterprises must change their work as soon as possible taking into account the new requirements.

The improvement of the machine tool building sector is one of the decisive links in rebuilding our economy. Every Communist and every worker are called upon to recognize fully their personal responsibility for the results of their work, persist in mastering progressive equipment and become active participants in the renovation of production.

The following appeals of the CPSU Central Committee state:

"Machinebuilders! Yours is the decisive word in the reequipment of the national economy! Create high productivity machines and equipment more rapidly!

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INDUSTRY PLANNING AND ECONOMICS

UNWIELDY MANAGEMENT DELAYS INTRODUCTION OF NEW TECHNOLOGY

Moscow IZVESTIYA in Russian 29 Oct 85 p 2

[Article by Ye. Manucharova and S. Sklyarov, special correspondents of IZVESTIYA: "Stopwatch of Success: Key Task Is Introduction"]

[Text] You have not given any thought to what sends the huge number of official travelers out on the road? It has been my observation that they are not "pushers" and not "deliverers" but coordinators. Most of them have one concern and that is to obtain the necessary signature on the necessary piece of paper. Man-hours and ton-kilometers are expended just for the purpose of permitting (or prohibiting) strokes of the pen.

That is what Sergey Ivanovich Kuchuk-Yatsenko, well-known machine builder and science organizer, winner of the Lenin Prize and corresponding member of the Ukrainian Academy of Sciences, says. He is one of the inventors of the renowned "Sever" [north].

"...Born in his shirt," as is customarily said about a successful person. That is what was always thought about the machine "Sever" as well. It was created in a hurry--just 1 year--at the Arc Welding Institute of the Ukrainian SSR Academy of Sciences. It appeared at the pipeline route without delay at the start of the welding work in Urengoy. It was performing a very important task, that of releasing a large number of skilled spceialists. During one shift with a crew of 12, it does just as many joints as 56 hand welders.

The automatic machine was just right for work in the north. Naturally, it is precisely there that "technical policy"--as was said at the conference of the party-economic aktiv of Tyumen and Tomsk oblasts--"must be directed more toward achieving every possible saving of labor than in other regions through increased electric power per worker and the application of the most advanced technology and the very best machinery.

After examining the first models, the pipeline route asked for a larger shipment of "Severs." And they did not pass up the new machine abroad either; the United States bought a license. A very new enterprise, the Pskov Plant for Heavy Arc Welding Equipment, was set up to produce "Severs." Everything, it would seem , was working out better than ever.

It would seem.... Sergey Ivanovich Kuchuk-Yatsenko tells about what happened to the successful machine after that:

"When it came time for large series production, 'Sever" began to fall behind in the 'relay race of innovations', as the introduction process is now customarily called. It went into a skid while being transferred to the manufacturing plant. Twice as much time was spent on various coordination steps as on the creation of the machine itself and testing on the route. We have a lot of experience in introduction. It seems that we know how this is done. But here we continaully ran into the unexpected, some instruction hindering the transfer of documentation to the plant without the next signature. It was necessary to get 155 authorizing signatures. They were collected in the ministries, central offices and associated enterprises. Just think that for 2 years our people lived on trains and airplanes. All the paperwork filled more than 1,000 pages. Such are the requirements of the systems and procedures under which the creator of something is now forced to operate."

But what did we achieve as a result of all our fooling with the paperwork? The plant did not adopt what we wanted but just the first of the versions of the machine. And by that time, it was already possible and necessary to improve it. We as well as the plant understood this. Nevertheless, any correction in the area of modernization would have meant for us more wandering along the same infernal circles of signatures and approvals....

The collection of 150 signoffs and the creation of a thousand pages of paperwork made it hard for the scientists to work. But was this necessary for anyone? Doubtless. The marking time that was senseless from the point of view of some was seen by others as a safety reserve. What was a waste of time for some amounted to extra time for others--the enterprise--in preparing for the issuance of complex new equipment. Moreover, the 155 ill-fated signoffs for the researchers clearly worked in the interest of the plant. The complexity of the procedure for the drawing up of documents directly promoted the tendency toward inertia and also stimulated, to put it mildly, caution in the decisions on subsequent changes in technological processes. It can be said that the 155 signoffs increased by a factor of 155 the motivation to change nothing in the machine's design.

And they made no changes. They issued the first model of "Sever" over 5 years. There is such a very customary interval for industry: 5 years. In machine building, this is also the period in which the technical conditions of an item are determined. If the plant started up the production of output under these conditions and the output is also awarded the highest category, then one does not have to make any changes for 5 whole years. And it does not matter that a so-called "deformation of the competitiveness" of the item may very well have occureed during this time.

This year, however, they suddenly changed the fate of "Sever." The machine that is now going out on the line was developed under today's economic situation. The criteria formulated by the April CPSU Central Committee Plenum forced production to relate differently to new technologies and to the pace of their assimilation and to show more responsibility for its own stage in

introduction. In a very short time (just 6 months), the Pskov plant modernized that first basic model of "Sever" that it had pushed unchanged for so many years. It made its own important innovations and implemented all of the proposals for improvement that it had received from the inventors of "Sever" and operators. The plant handled the work of improving the machine through its own efforts, even though this item is expensive, complex and science-intensive. It applied pressure and the "impossible" turned out to be practicable.

The time has come when more and more production processes are performing new tasks set by the party. They are striving for a level of output that is equal to any in the world. This is by no means a simple matter.

Speaking is Vladimir Konstantinovich Lebedev, Lenin Prize winner and member of the Ukrainian SSR Academy of Sciences:

"World practice in the development of new equipment has its own laws: even the most nearly perfect machines must be renewed not from time to time but systematically. And as quickly as possible--every 2 or 3 years. Without this renewal, you cannot remain at the cutting edge of world technology."

The practice of Arc Welding Institute imeni Ye.O. Paton confirms the validity of his words. Scientists here are trying not to lose sight of production systems that reproduce their products. This is one of the reasons for the rise of the engineering centers of the Ukrainian SSR Academy of Sciences. Here they are doing everything they can to accelerate the pace of the systematic improvement of technology and products. To achieve success, it is necessary to adapt own's output to the changing demands of the world market and be first to enter that market.

And here our interlocutors recall a situation in which innnovators (also prize winners and academicians) chose a very strange path. They considered it necessary to conceal their own names when they improved a machine that they themselves developed. They simply gave to the plant officials all of their specific ideas for the modernization of their creation.

It is clear that such an unusual means of renewing technology violated all of the articles and paragraphs of the established and legalized order. But the final result of the actions of the scientists and rationalizers turned out to be simply splendid: the country received a modernized product in the shortest time and it went out in the world market in time.

The scientists traded in the highest class: not licenses but finished products. In so doing, they continuously improved them, conforming to world conditions. Hence their desire to make use of the "Trojan Horse" of rationalization proposals. Their agreement to certain sacrifices, including the concealment of the real names of the inventors, the refusal of bonuses, and the issuance of drawings under the names of others, is all the "price" of not wasting time and of avoiding numerous obstacles (authorizations, approvals and official signoffs) with which production can protect itself against the troublesome matter of systematic modernization.

Naturally, it is simpler and easier to live behind such a barrier. The lack of modernization and slowness in improving output are still not punishable. This is still not considered a lowering of its level (which is punishable, and severely). And since that is the way it is, one can mark time.

But the true movement of innovations is measured with those present-day chronometers that register hundredths and even thousandths of a second. They are used because too many teams are working with approximately equal strength. Approximately.... But in reality, the one who knows the value of those thousandths is always the winner.

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AUTOMATION TO RADICALLY REDUCE SOME MANUAL OPERATIONS

Moscow MASHINOSTROITEL in Russian No 9, Sept 85 pp 37-38

[Article by L.K. Fatyukha, candidate of economic sciences: "Indicators of the Level of Use of Manual Labor"]

[Text] The special large-scale program for reduction of manual labor in the industry of Zaporozhye oblast which was developed during the realization of the movement "Manual labor -- in the arms of machinery" in 1981-1985 called for mechanization of the work of more than 22,000 persons. As a result of the introduction of this program's measures, mechanization reached a level of 62 percent over four years of the 11th five-year period. More than 21,000 workers were freed from manual labor including 7000 performing heavy manual labor.

Experience in the realization of this program has shown that under the transition of industry to automation and cybernetics, it is necessary to further improve the methods used to plan and evaluate work to reduce manual labor. At the present time, for this purpose, a method developed by the USSR Central Statistical Bureau is used which has won a leading role in industry's introduction of primary-level mechanized equipment. In comprehensively mechanized and automated industry, qualitative indicators of the technical equipment of workers has become increasingly important and no allowance is made for this in the given method. At this stage of developed socialism, work is consistently and conscientiously being done to humanize labor and above all to humanize the type of labor that workers must perform and that is why a movement has begun to eliminate unskilled manual labor among workers directly involved in the technological process.

In classifying workers according to this principle, we must consider man's role and place in the production process: his direct participation in the technological process; his participation as equipment service personnel or operator; participation in remote control of the technological process using cybernetic technology. With this principle applied to all production workers, we can break them down into 5 groups of persons involved directly or indirectly in the technological process, i.e. workers operating, monitoring or fitting the process machinery (the percent of the latter will continually grow

and according to the data of several economists, reach 90 percent by the end of the century):

Industrial workers not directly involved in the production process and service personnel:		Industrial workers directly involved in the technological process and performing work:		
using computer and cybernetic technology	manual methods	using machinery Process entirely mechanized	Process partially mechanized	manually
I	II	III	IV	V

Therefore, in contrast to the method presently used, a feature of this method is that it tries to classify manual labor according to the place and role taken by the worker in the production process. Personnel indirectly involved in the technological process should include machine operators, fitters, adjusters and metal workers. As cybernetics gains a greater role in industry, there can emerge a new group of workers that use cybernetic technology for remote control of production. Breaking down the worker groups with regard to the degree to which production is mechanized, we must remember that a fully mechanized process is one in which all of the basic and auxiliary functions are mechanized while in a partially mechanized process, it is only the leading functions that are so mechanized. The workers of the fifth group fall under primary mechanization. Their relation to the overall number of workers also characterizes the level of the use of manual labor.

With regard to the grouping of workers according to the suggested methodology, we can establish such indicators as the density of manual laborers in relation to all others as well as according to individual types of production, the structure of workers by group, manual labor costs per thousand rubles of standard finished production and per unit (relative) of work. The indicator of the use of manual labor has the advantage that in comparison to the indicator of labor mechanization, it considers the number of workers involved in the same type of work.

The suggested method has been tested in the work practice of industry in the Zaporozhye oblast. Its use does not supplant the present method but only proves the need to enhance it by considering the characteristics of professions, worker participation in the production process and the degree of mechanization of separate methods.

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INDUSTRY PLANNING AND ECONOMICS

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APPLIED RESEARCH IN FLEXIBLE PRODUCTION TECHNOLOGY SURVEYED

Moscow VESTNIK AKADEMII NAUK SSSR in Russian No 6, Jun 85 pp 63-72

[Article by Yu. M. Solomentsev, doctor of technical sciences, V. G. Serebrennyy, candidate of technical sciences: "Problems of Scientific Research in the Area of Flexible Automation"]

[Excerpts] In recent years, activization of scientific research directed toward increasing the efficiency of metalworking equipment has been observed. The introduction of progressive methods and means for machining using NC, industrial robots, adaptive control systems, etc. is becoming one of the main trends in its improvement. Modern requirements in the rapid readjustment of production for manufacturing new products pose the problem of transforming machinebuilding from the automation of individual operations and links of the production process to an all-encompassing automation of all its levels by flexible highly efficient equipment complexes.

Purposes of Flexible Automation

Until now, the rearrangement of machinebuilding production to manufacture new products was considered an unavoidable interval between periods of normal operation of the enterprise. Such a rearrangement was usually made separately, in sections, in order not to interrupt the production process; however, this unavoidably reduces the efficiency of production. Flexible automation provides new in principle possibilities for creating multiproduct production facilities, allowing an efficient change in production-technological ties in a complex of active equipment, and the functions of all of its components up to individual working machines, depending upon the characteristics of the manufactured products.

At present, certain experiences are being accumulated in the USSR and abroad on creating flexible production systems (GPS) for the output of large and medium series parts. However, the development of modern technology demands the constant expansion of small series production. At present, small series production in machinebuilding makes up about 70 percent of its total volume. The possibilities of an essential increase in the productivity of labor in small series production due to traditional technical and organizational measures have been basically exhausted at present. It is precisely here that the development of the mass introduction of GPS is urgently needed. The creation of flexible automatic systems thus becomes one of the key directions for developing all machinebuilding to further increase its efficiency.

The solution of the indicated problem requires the carrying out of a complex of applied and fundamental scientific research. In this connection, it is possible to point out the useful experience of cooperation between the institutes of the USSR Ministry of the Machine Tool and Tool Industry [Minstankoprom] and the USSR Academy of Sciences in carrying out joint scientific research work on machine tool building problems planned for the period 1981-1985.

At present, the Moscow Experimental Scientific Research Institute of Metalworking Machine Tools (ENIMS), the Mechanical Engineering Institute imeni A. A. Blagonravov of the USSR Academy of Sciences and a number of other sectors of scientific research, planning-design and technological organizations, institutes of the USSR Ministry of Higher and Specialized Secondary Education [Minvuz], as well as USSR Gosstandart under the guidance of the USSR State Committee on Science and Technology are developing an All-Union program of fundamental and applied scientific research on creating long-range flexible production systems.

Premises for Successful Implementation of the Flexible Automation Program

The successful solution of the mass introduction of GPS in machinebuilding enterprises in the country is based primarily a planned economy, which makes it possible to purposefully implement large national economic projects and the development of the scientific technological potential of the country on a high level.

Domestic machine tool building manufactures modern multipurpose machine tools, industrial robots, flexible technological modules with storage units, transport-warehousing devices and other auxiliary equipment, needed to form various types of GPS [1]. Great successes were achieved in the part of mass creation of durable quality tools and readjustable fixtures [2]. In the last 10-year period, it was possible to raise essentially the quality, reliability and operating speed of NC and of programable controllers made of microprocessors. Problems of automation, diagnostics and monitoring have been solved to a considerable degree. There is a considerable scientific reserve that makes it possible to solve problems of comprehensive automation as a whole. Here, it is necessary to indicate primarily serious research in the area of group machining and the technological classification of parts, adaptive methods for equipment readjustment, and optimal design of the technological process structures [3].

There are certain reserves also in the area of the quantitative evaluation of the structural flexibility of systems which makes it possible to obtain an efficient "flexibility-productivity" ratio at the design stage [4]. A number of typical structural GPS arrangements were developed, as well as a packet of applied programs for calculating their basic characteristics. Conditions for efficient interaction between GPS and nonautomatic production were identified. Automatic design systems were created for machine structures and components, and methods were developed for automatic design of optimal processes for machining parts in GPS using group technology and typicalized technological processes [5].

The enumerated results are a serious scientific base for creating efficient GPS. Already today flexible technological modules are being created in the country on the basis of work on automatic dimensional readjustment. They provide not only automatic readjustment of machine tools according to a program when a machined product is changed, but also an automatic dimensional adjustment and even a correction for the dimensional wear of the cutting tool.

Programed dimensional readjustment required the introduction into the lower level of the control system (NC device and programable controllers) of a number of additional functions, such as identification of the tool, measurement and automatic correction of the cutting edge position before the start of machining and, in the process of cutting, for the purpose of insuring the given precision. In this case, when operating according to a previously debugged program and stable characteristics of the technological system, it is possible to achieve GPS in which any sequence of parts passing through machine tools can be formed up to their piece-by-piece manufacture.

The solution of the given problem creates premises for the development of flexible automatic productions that combine several GPS (including those for various technological conversions), within whose frameworks it will be possible to organize machining sets of parts for assembling various products. Thus, flow line production facilities with a rhythmic output of products can be created in small series which eliminate the necessity of accumulating reserves of parts before assembling. This will permit a considerable increase in the output of finished products at existing enterprises and create conditions for cooperation supplies, and increase the mobility and efficiency of industry as a whole noticeably.

However, it should be recognized that research in the optimal design of GPS is still reflected poorly in domestic scientific technological literature, although the solution of this problem is no less important for the creation of a flexible system than for the creation of a technical base. It appears advisable to publicize the most interesting results of work in this area more widely including the following basic aspects of this problem:

design -- including automatic design of basic products;

technological -- related to the development of new progressive processes and the design on their bases of high productivity equipment that perform working and auxiliary operations without direct human participation;

organizational -- management -- automatic solution of problems of planning, organization and production process management, creation of improved systems to control and monitor basic and auxiliary processes, diagnostics of machine operation, etc.;

technical-economic -- optimization of basic indicators and development of a methodology for evaluating the efficiency of technical GPS solutions.

Wide publication of the results of scientific research in the indicated directions will make it possible not only to avoid errors in design when solving individual synthesis problems of efficient GPS structures, but also will, to a certain degree, help in determining expedient ways to develop domestic GPS.

The use of flexible production systems is the main direction of technical progress in the key sector of industry -- machinebuilding, and without a doubt, it must play a prominent role in the economic development of the country in the very near decades. At the same time, nonoptimal scientific technological and organizational solutions, as shown above, can turn out to be great losses. It appears advisable to form comprehensive temporary collectives of scientists and specialists from the USSR Academy of Sciences, Minstankoprom and Minvuz, as well as a number of ther sector organizations to provide the successful development of theoretical and applied problems in the given area. Such formsof work have proved to be correct many times in solving the largest national economic problems.

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INDUSTRY PLANNING AND ECONOMICS

EQUIPMENT INSTALLATIONS DISRUPT PRODUCTION FLOW, ACCOUNTING

Minsk NARODNOYE KHOZYAYSTVO BELORUSSII in Russian No 8, Aug 85 p 23

[Article by L. Selkina and I. Filatov, candidates of economic sciences: "Accelerating with the Brakes On"]

[Text] Thousands of new machine, apparatus and tool models have been introduced in this country in the last decade.

The tendency toward continuous updating of products is clearly followed in this republic also, especially in the area of machine-tool building. But in this there are complex problems in addition to obvious successes.

The reduction of development and introduction times for new types of machines, devices and products is an absolute requirementfor achieving technical progress. In analyzing product updating at heavy machine tool building enterprises, especially the Gomel Machine Tool Plant imeni S. M. Kirov, the authors call attention to a number of unanswered questions.

Experience has shown the promise inherent in the use of uniform and standardized assemblies and components. A number of products made by the Minsk Tractor, Truck and Machine Tool plants imeni Oktyabrskaya Revolyutsiya have reached standardization levels of 75-90 percent. This has resulted in a 1-1/2 to 2-fold reduction in the time required for production setup and a 2-3-fold decrease in design costs.

A great deal of work on standardization is underway at the Gomel Machine Tool Plant imeni S. M. Kirov. Five out of the 26 machine tools analyzed have a standardization level of 90-96 percent, four are between 80-90 percent, nine are between 70-80 percent and eight are between 54-70 percent. The achievement of this degree of standardization is largely due to current plant norms. An aggregate complex which allowed the creation of two models for different purposes with a high degree of component and assembly interchangeability was developed for the design of fundamentally new NC machine tools. During the development of fundamentally new NC machines, a new unitizing system was

created, allowing the production of two models with different purposes yet with a high degree of component and assembly interchangeability.

Now to standardization during the production engineering process. It is well known that all the work on documentation must be repeated every time there is a change in the product line. Thus, in the plant a significant amount of previously prepared documentation is used. The standardization and widespread unitization of assemblies has permitted the introduction of typical manufacturing processes and handling methods characteristic of large-scale production. On this basis it became possible to reduce the preparation time for new products by 30-40 percent and to decrease the amount of labor required for component processing.

As we know, tooling and instrument preparation requires an extended period of time which can delay the production of new items. For this reason the Machine Tool Plant imeni S. M. Kirov makes extensive use of universal assembly and alignment devices in addition to tools it produces internally.

The enterprise's designers and production engineers specialize according to product lines but use a parallel method of operation. Their work is automated and mechanized to the greatest extent possible. Many other positive contributions can be noted among the activities of other services in the plant.

But there is still something holding back renewal of the product line. As a matter of fact the problems are inherent in many other enterprises as well. What is involved here?

A shift to a new type of product of necessity is accompanied by changes in technology and production organization and it also brings about the need for using new materials. As a rule, additional outlays are required. These become greater as the period of preparation for the new products increases. Understandably, all of this cannot help but affect an enterprise's production and financial indicators. For example, some labor indicators, such as the number of workers and the salary fund, worsen. These increase due to the amount of work required by the new product, and the lack of experience as workers perform unfamiliar operations and unforeseen work. While the dynamics of labor productivity require the elimination of this unproductive period, it is impossible. It seems, however, that labor productivity doesn't fall. This is because the increased efforts during the training period are included in the production volume accounting. This is the method used to define wholesale prices for prototype products.

Thus, at the Machine Tool Plant imeni S. M. Kirov the production output for one norm-hour of work on the already developed Model 7403 mortising machine amounts to 6 rubles and 29 kopecks, while the same output during the development period amounts to 7 rubles and 28 kopecks. It is not hard to see that the labor productivity accounting (according to labor costs) for this model includes the development period costs with their 15.7 percent increase. A similar situation occurs in the case of other machine tool models.

The same applies to the adjusted actual labor productivity indicator which reflects the quantitative output of required products. In other words, the accounting looks better than reality. It doesn't even seem possible to determine the extent to which actual labor productivity figures have been distorted. The reason for this lies in the absence of a standard base for evaluating the product development time when establishing a plan for new equipment. Experience has shown that this is the most important means of shortening the development period (as a result, reducing the expenditures for this period) and of equalizing the actual level of labor productivity.

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INDUSTRY PLANNING AND ECONOMICS

WHOLESALE PRICES FOR NEW MACHINE TOOLS ANNOUNCED

Moscow EKONOMICHESKAYA GAZETA in Russian No 10, Mar 85 p 7

[Unattributed article: "In the USSR State Committee on Prices: Wholesale Prices and New Equipment" under the rubric: "Economic Information"]

[Text] The USSR State Committee on Prices, State Planning Committee, Ministry of Finance and State Committee for Standards have examined the results of work in 1984 on increasing the activity of the system of wholesale prices, bonuses and discounts designed to increase the interest of manufacturing enterprises in speeding the updating of their products and ending the production of obsolete items.

In 1984, the applicable ministries approved 6,300 wholesale prices for new and modernized equipment, machines and tools. In terms of their technical and economic indicators, nearly half of the items covered (48 percent) meet or exceed the levels of the best domestic and foreign versions. Incentive bonuses have been determined for these products based on their impact on the national economy.

On the whole, for the 11 machine tool building ministries the bonus total for 1984 was 740 million rubles, 200 million rubles over the sum for 1983. Seventy percent of this amount was allocated to funds for economic stimulation of new technology at scientific research institutes, design bureaus and manufacturing enterprises. Of the 3030 wholesale price incentive bonuses for new and modernized equipment approved in 1984, 197 bonuses amounted to 30 percent of the price. Bonuses ranging from 10-30 percent were approved for 1170 types (brands and makes) of machines and equipment.

In order to stimulate the production of new items requiring fewer materials and less labor while maintaining their technical/economic parameters and quality, wholesale prices are based on the price level of the equipment replaed. In other words, all of the additional revenue is retained by the manufacturing enterprise.

Moreover, in spite of the additional economic stimuli, industry is slow to replace production equipment and machinery, new and highly efficient technology representing technical progress in the national economy is still

being inadequately used and there is little production of fundamentally new products.

In 1984 the number of wholesale prices approved for new and modernized equipment was not significantly greater than in 1983. There are no changes in product renewal in the sectors which are working under the experimental economic conditions (the Ministry of Heavy and Transport Machinery Building and the Ministry of the Electrical Equipment Industry).

In order to speed the withdrawal from production of obsolete products discounts of from 10-30 percent are being offered in addition to the wholesale prices. The 11 machinery building ministries have established 413 discounts from the wholesale price for products subject to removal from production in accordance with the sector plans of the machinery building ministries.

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TRENDS IN MACHINE TOOL DELIVERIES REVEAL PATTERN OF SHORTAGES

Moscow TEKHNIKA V SELSKOM KHOZYAYSTVE in Russian No 5, May 85 p 51

[Article by M. M. Frumkina, S. P. Avdeyeva, G. N. Biryukova. Maloyaroslavsk GOSNITI and TsOKTB: "Improvement of Planning of Metalworking Equipment"]

[Text] The USSR State Committee for Agricultural Equipment has considerable fixed production capital available. The active part of the fixed capital is metalworking equipment for repair (restoration) and manufacture of machine parts at repair enterprises.

Questions of accounting for and planning its movements became of special importance. Thus, from the time of the metalworking census in 1972 for the past 10 years with an annual delivery of metal-cutting machine tools (MRS) of about 10,000 units and a write-off of 2000 units, the machine tool park increased by only 15,000 instead of the expected 80,000.

In the Maloyaroslavetsk affiliate of the GOSNITI [State All-Union Scientific Research Technological Institute of Repair and Operation of the Machine-Tractor Plant] and the TsOKTB [Central Experimental Design and Technological Bureau] norms were developed for the requirements of metal-cutting machine tool and forge-press equipment in the future, based on equipment productivity norms and machine tool capacity norms.

The analysis of data on the availability, deliveries and write-off of this equipment in the USSR State Committee for Agricultural Equipment indicated that in individual years, indicators for the republic associations of deliveries and write-offs do not correspond to the actual ones. It was found that the associations do not check indicators annually. There are frequently cases of noncorrespondence between data on the availability of metal-cutting equipment and indicators at various services of one association; there are no records in the repair departments on received equipment and no proper documentation of its write-off.

Form 16-SKhT of the annual report of the republic association does not account for "other equipment," while the structure of the available equipment differs from the rated one. Received equipment does not compensate for the deficient equipment and does not take into account its structural relationship.

In recent years, deliveries of lathes were reduced without substantiation; boring, grinding and milling machine tools were not delivered in sufficient quantities. At the same time, more drilling machine tools are delivered than required and they now make up 40 to 50 percent of the total number of metal-cutting machine tools.

On the basis of an analysis of the age composition of equipment (Table 1), it was found that in the individual republics up to 11-14 percent of the metal-cutting machine tools are over 20 years old and should be replaced by new ones. Worn and outdated forge-press equipment (KPO) account for 22 percent.

Calculations of metal-cutting equipment requirements make it possible to prepare correct orders for its acquisition. However, they are being prepared on the sites without proper substantiation.

The generalized analysis of the availability of such equipment made it possible to determine the level of how well they are supplied.

Table 1

Union republic	Age of equipment, %: Up to 10 Years		10 to 20 Years		over 20 Years	
	MRS	KPO	MRS	KPO	MRS	KPO
RSFSR	50	57	39	35	11	8
Ukrainian SSR	41	43	45	42	14	15
Belorussian SSR	57	64	37	34	6	2
Uzbek SSR	45	34	44	54	11	12
Kazakh SSR	50	31	45	60	5	9
Georgian SSR	58	51	39	47	3	2
Azerbaijan SSR	45	40	43	38	12	22
Lithuanian SSR	59	97	36	41	5	2
Moldavian SSR	42	52	51	42	7	6
Latvian SSR	56	59	33	32	11	9
Kirghiz SSR	43	55	45	33	12	12
Tadzhik SSR	50	71	42	28	8	1
Armenian SSR	54	75	45	24	1	1
Turkmen SSR	63	69	31	29	6	2
Estonian SSR	53	53	38	40	9	7

As can be seen, the lowest availability is that of automatic and semiautomatic turning machines -- 42.4 percent and milling machine tool -- 60 percent. At the same time, there is a surplus of drilling (296 percent) and stripping-grinding machine tools (178 percent). A similar situation pertains also to forge-press equipment.

Table 2

Name of equipment	Availability level, %
Metal-cutting machine tools	
Total	81.5
Turning, turret lathes	53.5
Turning automatic and semiautomatic machines	42.4
Milling	60.0
Planing and mortizing	66.2
Drilling	296.0
Boring	67.3
Extrusion	55.8
Grinding	76.5
Stripping-grinding	178.7
Sharpening	94.8
Others	9.2
Forge-press equipment	
Total	113.1
Mechanical presses	163.8
Forge-press automatic	94.9
Hydraulic presses	137.0
Hammers	74.2
Shears	78.9
Truing and bending machines	248.1

In this connection, when preparing the balance and the equipment distribution plan, it is necessary to specify the type of machine tools in the annual report of repair organizations (section III, form 16SKhT) in accordance with the type specified by the USSR Gosplan.

Besides section III on the availability of metalworking equipment, it is advisable to introduce curves of delivery and write-off of the equipment for the past year. Delivery availability and write-off of metalworking equipment in republic associations (equipment movement) must be concentrated in the Chief Mechanical Engineer Administration.

Due to the lack of a single opinion as to which technological group this or another machine tool belongs which leads to inaccuracy in their number, we consider it necessary to distribute a list of technological groups of MRS and KPO of the USSR Gosplan to repair enterprises.

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INDUSTRY PLANNING AND ECONOMICS

BRIEFS

ROBOT ENGINEERS TRAINING -- Minsk -- Engineers who now work in design bureaus, sector institutes and enterprises, did not study robot technical systems and flexible automatic production when they were students. Therefore, they do not know them. As is well known, even the most perfect machine will not give its best to the national economy in unskilled hands. The USSR Minvuz [Ministry of Higher and Special Secondary Education] prepared a list of specialties and specializations of higher educational establishments on preparing engineers in robot equipment, microprocessors and automatic design of flexible production systems. Study plans and programs were created. Some vuz'sundertook the active training of students according to these plans. The Moscow Machine Tool and Tool Institute and the Moscow Higher Technical School imeni N. E. Bauman were the first ones to do that. About two years ago, we in the Belorussian Polytechnical Institute, also created a "Robots and Robot Equipment Systems" Faculty. At first, training was done in three specialties then three more were added. The first group of robot equipment engineers will be graduated in 1986. Engineers trained in flexible automatic productions are also trained in two other faculties. As a result, the institute will be able to issue diplomas in eight of twelve specialties on the USSR Minvuz list. The requirements for such engineers are very much greater. However, dozens of vuz's continue to train engineers specializing in machinebuilding technology, the production of metal-cutting machine tools and tools, using old programs. It is claimed that not all enterprises switch to automation at once, that even those who do not know about robots will find work. However, it must be acknowledged that the real reasons for this situation are that vuz managers are frightened by the necessity of retraining the instructors themselves and reequipping laboratories with sometimes very expensive equipment. The situation is no doubt troublesome, but one cannot live in the old way. There is inertia in republic ministries of Higher and Secondary Special Education. They do not demand of their subordinated vuz that they review their work in accordance with the requirements of the day. This means that young engineers must be retrained immediately after they graduate in the process of work. This is not the best way to train specialist cadres. [By G. Khutskiy] [Text] [Moscow PRAVDA in Russian 31 Mar 85] 2291

PLANT TECHNICAL MANAGERS' COMPETENCE--After graduation from the institute, I worked in the assembly shop of Krasnyy Proletariy Plant as a foreman's assistant. We produced the well-known 1K62 machine tools. At the same time, we assembled the more precise 1K62B. Strictly speaking, they differed from the "main" machine tool in that, out of the entire mass, we chose for them

parts with minimal deviations from the nominal value. And suddenly, tne conveyor for the assembly of spindle units went haywire. The precision was lost: severe wobbling of the spindle made it impossible to use the spindle units in the high-precision machine tools. The director, chief engineer, and chief designer of the machine tool joined the search for the malfunction. They were not able to discover the reason for the wobbling. The highly skilled Kostyunin, who earned more than I did and therefore did not appreciate enginners, said maliciously: "Look how many people are standing around uselessly and are unable to do anything! The state is paying you money for nothing." I listened to him and I wanted very much to find the reason for the wobbling to show that they did not train me in vain. I surmised that the reason was unusual. After all, dozens of experienced specialists could not find it. Since all of the measuring instruments were in use, I carefully felt the parts and thought it over. And suddenly, running my fingers over the edge of the spindle clamp, against which was resting the rear thrust bearing, I felt minute scoring on it that could not be seen. So as not to reduce the surface of the thrust clamp, the designer decided not to bevel the edge of the clamp and, as a result, the slightest contact with this edge in shipping or in assembly caused scoring and an imperceptible skewing of the bearing relative to the butt end, producing, in turn, an increased radial and axial wobbling of the front end of the spindle (10 to 15 micrometers instead of 5 micrometers). Indeed, there was not room for a normal bevel but, to avoid scoring, a bevel of 0.5 X 45 degrees was sufficient. I told Kostyuninu that it was necessary to introduce the bevel, and he just waved me off: nothing of importance. I told this to the foreman and the shop director and they made fun of me. They were afraid to approach V. Levshunov, chief designer and winner of state awards. Nevertheless, somehow after the shift I risked talking to him. To my surpise, he did not make fun of me and, flashing the lens of his glasses, he set about to check out my idea of introducing the bevel. I turned out to be right, the bevel saved the day. The very next day, the conveyor worked normally. [Moscow TEKHNIKA I NAUKA in Russian No 8, Aug 85 p 47]

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METAL-CUTTING AND METAL-FORMING MACHINE TOOLS

OBJECTIONS TO IMPLEMENTATION OF NC MACHINES STILL NOTED

Kiev RABOCHAYA GAZETA in Russian 11 Nov 84 p 2

[Article by V. Fedorov, Novgorodskoye, Donetsk Oblast: "Machine Building: Performance of Industry; 'Must Become Young Again'"]

[Text] The Novgorodskoye Plant imeni Petrovskiy is the only enterprise in the country specializing in the manufacture of high-lift pumping plants, pneumatic motors and other unique products with which mining equipment is outfitted. It is located in the very center of the Donetsk Coal Basin, in the surroundings of the coal mines of Dzerzhinsk and Gorlovka. Therefore, a shortage of working hands is constantly being felt: For miners both the pay is higher than for machine builders, and there a few more benefits, and, besides, the profession is more romantic. In a word, the local youth are drawn to the mine with greater desire than to the lathe. As of the beginning of 1982, for example, there was a shortage of 112 machine tool operators at the plant.

"This is more than an entire shift of one of our machine shops," Plant Director V.V. Gobrusev says. "The production plan was in danger of failure. It is not hard to imagine what losses would be borne by coal miners and the national economy as a whole if by our fault miners received less than they should of the anticipated amount of hydraulic supports, cutter-loaders and other equipment!"

[Question] But the collective coped with the quota, did it not?

[Answer] "Yes. Furthermore, by the end of the year we even turned out to have 40 'superfluous' machine tool operators."

How come? Were they able quickly to find 150 highly skilled workers, or did the ministry, taking into account the personnel shortage, adjust the plan toward a reduction in total product output? Neither one nor the other.

New equipment came to the aid. The plant acquired the first two machine tools with numerical program control two years before the critical situation with machine tool operator personnel. And then it received permission to form a large design and production process bureau for setting up and attending to machine tools with numerical program control, automatic machines and semiautomatic machines. Experienced Engineer V.F. Kolesnikov headed it up.

There was not yet any such precedent for the plant to create for two machine tools, be they even with numerical program control, an entire department to attend to them. But the director knew what he was doing. He saw in the very near future at his enterprise dozens of units of the most modern metal-working equipment which is able to replace the labor of hundreds of highly skilled lathe, milling machine, boring machine and drilling machine operators.

"The main thing was that it was necessary to gain time," Valentin Valeriyevich explains now. "Usually enterprises, in replacing or forming new machine tool inventories, at first hand their maintenance over to their old services and only later create new ones. We acted the other way around. And we gained. The third, fourth and all subsequent machine tools which the plant soon began to acquire were installed then and there and were completely loaded with work."

In a short time V.F. Kolesnikov created from the number of young workers and engineers a group of people with similar views, each with a high personal performance potential. The man does not dispense praise very generously; nevertheless, he characterizes his subordinates as follows:

"The majority of the boys are simply fanatically devoted and in love with electronics. If, for example, it is necessary to urgently find and eliminate an error in the operation of a microprocessor--the machine tool's 'brain'--each one is ready to forget about time, eating, everything, until the machine starts working!"

In his forty-five years, Kolesnikov himself, too, has not lost his boyhood enthusiasm.

I had occasion to witness the following scene. Vladimir Filippovich brought and placed on the plant director's desk a roller bearing of very complex design, wrapped in a rag, and resembling a miniature roller conveyer. In multispindle automatic machine tools with numerical program control (ChPU) they make possible the correctness of longitudinal transfer. They work under conditions of the highest precision class. And as soon as the rollers or bearing race are worn out the bearing must be replaced.

Kolesnikov came with the suggestion to set up the production of these bearings for themselves in the tool shop. "We are tired of sending messengers after them," he explained tersely.

And here I had occasion to observe a remarkable metamorphosis. Director Gobrusev, having barely taken the bearing into his hands, there and then was transformed from a manager and administrator into a designer, production process engineer and metalworker-toolmaker. Distracted from everything, he and Kolesnikov began discussing and arguing how best to approach the manufacture of a highly complex product not characteristic of the plant.

"Well, we will try," the director finally agreed.

Kolesnikov was satisfied. And having refused to talk with a correspondent prior to this ("Better let the production process engineer talk to him."), he now himself sat behind the desk and talked about the work of the bureau and about his people. But even then he remained sure of himself: He was categorical in his evaluation of people, argued and defended his opinion.

This, when the conversation concerned Boris Adamenko and Vladimir Pudovkin, operators of a new generation of automatic lathes with an electronic control system. Together with plant Chief Production Engineer Viktor Ivanovich Muravenko we observed their work. And Viktor Ivanovich then praised these young fellows for the fact that they themselves can correct a machine tool program in the case of necessity.

"But I say that they are still not old enough for praise," Kolesnikov argued heatedly. "They do not have the awareness and feeling of responsibility as foremen Vladimir Karpov and Petr Alendar' do. They are really dedicated to the common cause. And they were the first to switch to a single detail, and the first to use KTU's [remote control switches]."

"Is Alendar' not of the Alendar' Dynasty?" Gobrusev asked.

"He is. The son of Viktor, the grandson of Platon," Kolesnikov tersely articulated.

Out of 22 production engineers and maintenance people attending to machine tools with numerical program control, automatic machines and semiautomatic machines, Vladimir Filippovich "forked out" in his praise to three more, in addition to Pereverzev and Sharapov.

Many of those whom Kolesnikov calls good electronics people the plant directorate by agreement with the trade union committee accommodated in making living arrangements for them. In due time Gobrusev managed to obtain before the executive committee of the Oblast Council of People's Deputies the right to independently resolve questions relating to development of the plant settlement. And the plant is now constructing by its own manpower homes which are splendid not only on the outside but also with respect to interior planning and decorating. To get an apartment in such a building is the dream of many plant workers.

"When I came to the plant 12 years ago," the director related, "there were a little more than 150 people in line to get new apartments. During this time they rented twice as many apartments. And the line has grown just as much."

But the right to celebrate a housewarming in a new apartment must be deserved. At the plant's checkpoint there are regulations posted in which it is stated that for poor-quality work and the violation of discipline, for the first offense a member of the collective is deprived of a certain percentage of his bonus, for the second, of 13th wages, and for the third, he is moved back by one year in line to obtain an apartment.

[Question] And have there been such cases?

[Answer] "Yes, but now there no longer are."

Then an argument again flared up behind the table. Each one--Gobrusev, Kolesnikov and Muravenko--defended his point of view on the effectivness of the use of machine tools with numerical program control, automatic machines and semiautomatic machines. First they operated with hundreds and tens of thousands of rubles, and finally changed to kopecks--the cost of the smallest parts in a series of more than 1000 pieces, whose processing the new machine tools have taken upon themselves. And then the following picture was drawn. There are a total of 400 metal-cutting machine tools at the plant. Of these, 36 have program control and 30 are multispindle aggregated units. But they are now providing in terms of value just about half of the enterprise's monthly program. The shift factor for machine tools with numerical program control, automatic machines and semiautomatic machines is nearing 2, whereas that of the remaining machine tool inventory is 1.52, versus a plan figure of 1.42.

"But the main thing," Valentin Valeriyevich summed up, "is that the orientation toward advanced equipment helped us to solve the problem of highly skilled personnel. The very nature of people's work changed. Now not a lathe operator in the usual sense of this trade stands behind a machine tool with numerical program control or, for example, a multispindle automatic machine tool, but an operator whose duties include only removing and setting up a part, and checking the precision and finish with which it has been machined. One worker now attends to two or three and not infrequently four machine tools at once."

When I had already finished working on this material, I recalled a story which, it seems, ought to be written into the work biography of the Plant imeni Petrovskiy. Recently in one country which buys mining equipment from us it was decided to arrange a "committee of experts" for it, having invited for this purpose specialists from a distinguished West German firm which competes with us in the world market. For several days the specialists hypercritically, as they say, analyzed piece by piece the entire set of equipment for a mine face--the cutter-loader, hydraulic supports and the conveyer. But they could not make even the most trivial complaint about the pumping plant made by the collective of the Plant imeni Petrovskiy. And, by the way, all its parts, with the exception of one key and keyway for it, were machined precisely on the new machine tools.

I recalled also Valentin Valeriyevich's phrase in this connection:

"Now we are already taking aim at a new generation of these machine tools. It is necessary to become young again."

In November it will be 90 years since the day of the plant's founding.

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METAL-CUTTING AND METAL-FORMING MACHINE TOOLS

UNDERUTILIZATION OF MODERN NC MACHINE TOOLS NOTED

Moscow EKONOMICHESKAYA GAZETA in Russian No 22, May 85 p 22

[Article by Ya. Glezer: "New Equipment Works in the Old Way" (Minsk)]

[Text] The number of NC machine tools increases every year at Minstankoprom [Ministry of Machine Tool and Tool Industry] enterprises in Belorussiya. Where the new equipment is used economically, placed in operation on time and operated competently, it acts efficiently and increases the productivity of labor. This is the way it is at the Minsk Production Association for the Production of Broaching and Shearing Machine Tools imeni S. M. Kirov, the Minsk Machine Tool Building Production Association imeni October Revolution, the Gomel' Machine Tool Building Plant imeni S. M. Kirov, etc.

Regrettably, as shown by a check, the work done by the Belorussian Peoples Control Committee indicates that there are many enterprises in the republic where the new highly productive equipment is utilized unstaisfactorily, stands idle and goes out of order prematurely. Here are several examples.

At the Pinsk Forge-Press Machine Plant (V. Rakhin, chief engineer), the Orshansk Tool Plant (I. Koroshchenko, chief engineer) and in a number of other plants the shift coefficient is slightly greater than unity, while the loading coefficient of NC machine tools is 0.6 to 0.7. Or the facts are as follows. It took three years instead of three months to install NC machine tools at the Pinsk Forge-Press Automatic Lines Press. At the Vitebsk Grinding Machine Tool Plant (Yu. Dron, chief engineer) six NC machine tools that cost over 700,000 rubles stood idle for over 3.5 years. A check indicated that the new high productivity equipment does not have enough tools, fixtures, intermediate products and programs. A number of enterprises do not have skilled operators.

The Committee punished the ones responsible for the unsatisfactory utilization of NC machine tools. I. Koroshchenko, chief engineer of the Orshansk Tool Plant was reprimanded. L. Delts and Yu. Dron, chief engineers of the Gomel Machine Tool Plant and the Vitebsk Grinding Machine Tool Plant was admonished. A. Gavzinskiy, chief engineer of the Vitebsk Machine Tool Plant imeni S. M. Kirov, was shown the necessity of the efficient loading of NC equipment and of increasing its yield. As far as the Pinsk Production Association for the Manufacture of Cast Equipment and the Forge-Press Automatic Lines Plant were concerned, the Committee decided to direct the check of materials to the Minstankoprom to give them practical help in eliminating shortcomings in the

utilization of new machine tool equipment. Enterprise managers were asked to take efficient measures to improve the utilization of NC machine tools.

It is assumed that the Minstankoprom will not limit itself to helping only the Pinsk enterprises, but will also monitor this important matter at all plants and associations in their jurisdiction.

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METAL-CUTTING AND METAL-FORMING MACHINE TOOLS

NEW METALWORKING MACHINES OBSERVED AT MANOMETR PLANT

Moscow MATERIALNO-TEKHNICHESKOYE SNABZHENIYE in Russian No 8, Aug 85 pp 43-46

[Unattributed article: "On the Road to Technical Re-Tooling"]

[Text] A little more than a year and a half has passed since the Manometr Instrument building plant in Moscow and a number of other enterprises in the capital began work on an economic experiment. The expansion of an enterprise's rights in the areas of planning and management and the increase in its responsibility for the bottom line have had positive results. It can already be said that the development of democratic principles in leadership, the expansion of the worker collective's role in controlling production and the widespread introduction of cost accounting have created conditions which stimulate the quality, highly efficient work, initiative and enterprise needed to accelerate the pace of scientific and technical progress.

This is the aim of the Communist Party for the Soviet people. "The main goal now," emphasized Comrade M. S. Gorbachev in his speech at the CPSU Central Committee meeting on questions of accelerating scientific and technical progress, "is to seek out and activate all reserves to increase production efficiency and product quality. Our personnel must understand the critical need to redirect every enterprise and sector, as well as the national economy, toward the intensive path of development."

At the Manometr plant, introduction of the latest achievements in scientific and technical progress is under the control of the mechanization and automation department, started in the late 1950s. The large-scale, direct reconstruction of production was begun comparatively recently however. Two "fledgling" offices have appeared in the department: the robotics and the numeric control machine tool groups. Although operational since the year before last, they demand increased attention because of their responsibility for deciding the fate of all modern and advanced concepts.

The robotics complex came to life in August of 1984 in the noisy stamping shop. It allowed the automation of a complex job such as stamping. It must be noted that the introduction of appropriate equipment was no easy matter. Nevertheless it was accomplished on schedule; a fact of high importance in an economic experiment.

The robotics complex is powerful: it has increased labor productivity (now 150 parts are produced each month, a figure well above previous levels) and can handle more than 400 types of dies. There is another important factor: within the first four months of use it changed the workers' attitude toward stamping operations.

"With the introduction of robots," says section foreman S. Strunin, "people are fully protected against accidental injury. The robot does everything itself. Humans only have to fill the magazine with metal plates. The robot's hand takes the magazine and places plate after plate under the stamping press."

Even the section's appearance has changed. The plant's painters and maintenance personnel have been at work here. One's eyes are dazzled by the orange color selected for machine tools and tile walls, as well as by the cleanliness of the work areas.

While the annual economic effect is still an estimated figure, at a full complex load it will be 16,000 rubles. The payoff period for this expensive equipment is about four years.

Among the major and significant innovations made by the robotization office is the introduction of 22 robotized stands, designed to monitor and calibrate MO gauges, in one of the assembly shops and four robotics units in an automated shop to produce parts for gauges used to measured steam, air and liquid pressure. These types of gauges are needed at compressor plants and factories, as well as in electrical power stations. They are also vital in agriculture.

Special attention at the enterprise is devoted to robotizing the section which produces consumer goods. A robotics complex will soon be at work here.

NC machine tools are significantly increasing labor productivity while improving its quality and reducing the number of workers required. At this time many enterprises are opening shops and sections with these machines.

One of these sections has been started at the Manometr facility. Here, components are produced for a new product, the Sapfir-22 instrument with integrated microcircuits.

Just as all new equipment, NC machine tools require painstaking calibration and periodic maintenance. At times their work is interrupted. To a great extent these interruptions are due to the fact that production is not attuned to the introduction of new technology. Sometimes, for example, control programs were prepared by means which are poorly automated. Even the section's weights and measurements capability was inadequate. All measurements of completed products were carried out in a central laboratory and the machine tools stood idle while this was being done. Measurements began to be taken directly in the shop only when the Kalibr plant introduced new emitters. The new equipment's increased sensitivity required a stable power supply. This was not easy to achieve. In all, a number of problems had to be solved.

Personnel questions were especially critical. When the new equipment appeared there were few people specialized in its operation. These specialists had to be sought out in each collective. In the meantime, engineers donned overalls and produced the prototype component batches. However, the economic experiment's strict conditions, in particular the extensive responsibility for the results of NC machine tool introduction, helped to put everything in place.

The widespread introduction of the new machines into production facilities was further assisted by the fact that some of theSapfirinstrument's components could not be produced on general purpose equipment. These components, the basic product line, are the ones needed to fill customer orders.

The majority of these devices are produced for electrical power stations. For this reason a "workers' relay" competition agreement was signed in March of 1984 between the Manometr collective and the builders of the Surgut GRES-2 to complete the equipping of this unique giant of Soviet power engineering and allow the first 800 thousand-kilowatt power generation unit to produce commercial electricity ahead of schedule. The joint agreement provided that the Manometr collective would shorten the delivery schedule for Sapfir converters (a new design). However, working under the strict terms of the economic experiment, manufacturing personnel sought additional capabilities to speed instrument delivery. The required number of Sapfirs was shipped to the power station builders in the second quarter of 1984, ahead of schedule. Thus, the Moscow enterprise is making its contribution to the nation's power engineering program.

NC machine tools are also well-suited to small-scale production. While the best general-purpose lathe could produce 20 complex components per shift, nearly four times that amount can be produced now.

The capability of changing product lines quickly and without special efforts is one of the features of NC machine tools in use at the plant. One worker can easily control several tools. These methods of organizing work may have become normal in weaving operations but they are entirely new in lathe work.

For example, now in the mechanical shop one operator simultaneously services two tools. This allows some of the highly qualified specialists to be freed for other duties. Experienced specialists as well as beginners can produce high quality output on the new machines. Workers however are really in need of training, especially advanced training. Experience has confirmed this. An untrained person cannot master a complex machine tool.

The process of reducing physical and mental labor, which is so vital to production, is steadily continuing. This demands an engineering approach to work, new work process organization, strict attention and discipline. Production has become more civilized with the introduction of NC machine tools.

Another 10 NC machine tools are scheduled for introduction in the Manometr plant this year. There will be nearly 30 units by 1990.

In order to organize efficient operation of the new equipment and obtain maximum labor productivity, the plant is already pondering the question of creating self-financing brigades in the sections where this equipment is operating. Work in a single detail will allow the section manager and the brigade foreman to efficiently distribute labor resources, make full use of working time and exercise on-the-job control over equipment tasking. There will be interest in more rapid development of new components and increased labor productivity.

The Manometr people even faced the problem of a lack of working space with sufficient load-bearing capacity. Design work had to be carried out and the levels of one building had to be refitted. All of this resulted in the conditions required for application of the complex equipment.

Now the NC machine tools have confirmed their high efficiency. Their use alone in 1984 allowed the enterprise to achieve an economic effect of over 30 thousand rubles. This freed five workers. When auxiliary production is considered, the effects are even greater. The introduction of electro-erosion units and semiautomatic milling machines is providing a savings of more than 50 thousand rubles per year.

But talk of high final results would be incomplete if mention was not made of the level of delivery fulfillment. All orders are being filled within the contractually agreed delivery schedules.

At the beginning of 1985, a telegram was addressed to the general director. In this message the USSR Ministry of the Gas Industry expressed its deep thanks to the Manometr collective for its timely supply of Sapfir instruments to unique gas fields and mainline gas transport systems.

The collective's successful work brought it some direct benefit. Its 100 percent completion of all contract orders resulted in the addition of some 100 thousand rubles to the material incentive fund. This was no small matter. As we know, the introduction of new technology involves large material expenditures.

Another technical innovation is the special ion-nitriding unit with the lovely name "Bulat". It was installed in the plant's tool shop last summer. The Bulat allows the production of wear-resistant, strong and reliable cutting tool components.

The capability of applying wear-resistant coverings on tools and parts has been markedly expanded with the development of vacuum technology and equipment for obtaining low-temperature plasma. The most promising methods are those in the process of which the atoms and molecules of the coating materials are ionized. Currently, plasma spraying is the most widely used of these methods. The Bulat itself confirms the effectiveness of this method.

Let us examine just the hard-alloy plates used in machines for the storage section of the tool shop. While previously they had a 2-hour service life on the machines (after which they were totally unusable), with the introduction of spraying they now can be used by tool makers for 2 days. Worn parts can

then be cleaned and processed through the Bulat. Only about 20 percent of these plates cannot be reused.

The Bulat has become indispensable for use in these conditions of intensified production. In fact most machine and tool component failures are due to working surface wear rather than breakage. Low cutting tool wear resistance leads to a need for increased tool production and a high level of material wastage. This is why strengthening machine and tool components is a task of vital national importance. The Bulat is helping to solve this problem.

Production automation through the use of computer technology is also promising. While in the area of control much has been done to introduce automation systems, only the first steps have been taken in the design of production processes and equipment.

Manometr is doing its part in the overall achievement of scientific and technical progress. The plant was one of the first in the sector to begin widespread introduction of automated design. This required many months of search, failure, disappointment and hope. Positive results have been obtained already. The plant is using systems for the automated design of shearing dies and production processes for automated lathe production with the preparation of control programs for Avtoshtamp-2 NC machine tools.

In its time the Avtoshtamp-2 system was acknowledged as being one of the best developments in its field. It designs 17 types and 608 sizes of shearing dies. It is used to prepare control programs for the the production of 50 doubler dies (18 combinations) in the plant's tool shop. [rest of original illegible].

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METAL-CUTTING AND METAL-FORMING MACHINE TOOLS

LARGE VOLUME OF RESEARCH IMPROVES PRODUCTION, FMS SYSTEMS

Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 14 Sep 85 p 2

[Article by L. Volkevich, doctor of technical sciences, professor and chairman of the All-Union Council of Scientific and Technical Associations' Committee on Automation and Mechanization of Manufacturing Processes: "The Gear Conquers in the USSR State Prize Competition"]

[Text] Here is a paradox: until recently the manufacture of a mass-production item such as a gear could not be automated. One of the main reasons for this was the high degree of precision with which the geometry of the gear tooth had to be duplicated. To meet this demand, the tool and the blank have to simultaneously execute up to five mutually coordinated movements during the production process. For comparison, a mere two movements suffice to produce the product required from a lathe or drill press.

From this point of view, the work carried out by specialists at the Vitebsk Special Design Office for gear-cutting, polishing and grinding machines and their associates can be seen as a true breakthrough to the heights of automation. Through a great deal of scientific research, experimental and prototype-design work they have succeeded in creating new and effective methods of machining gear teeth. They have provided the foundation for a broad range of machine tool automata equipped with original loading devices automatic manipulators, storage units and other devices which assure "unmanned" operation. Previously, unique machines were built for nearly every type of gear, now 18 basic models cover a wide range of products.

But the creators of this new equipment went still further: from automated machine tools they made the qualitatively advanced step toward development of automated complexes and automated lines. The complexity of the problem they solved is perhaps best indicated by the fact that no one in the world had succeeded before in creating automatic lines for this purpose.

More than 5000 fully automated gear-cutting units have been developed and successfully brought into production in this country in a comparatively short time. These machines are responsible for a 2-4-fold increase in productivity and a nearly 5-fold reduction in the number of servicing personnel. According to calculations by specialists, the total economic effect has exceeded 100 million rubles.

An equally important result of this work is the fact that it has opened up the possibility of shifting to the design of flexible automated systems. Machine tool automata that can be quickly converted to several types of gear production and that are capable of holding an entire shift's worth of automatically handled blanks are already at work in the nation's enterprises. Fifty two patents on inventions and 10 certificates for commercial prototypes provide evidence of the level of scientific and technical work being accomplished. It appears that the joint effort of machine-tool builders and enterprises making full use of the highly efficient technology has moved up in the competition for the USSR State Prize.

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METAL-CUTTING AND METAL-FORMING MACHINE TOOLS

BRIEFS

NC MACHINE TOOLS -- Baku -- An NC machine tool section was put in operation in the machine shop of the Baku Machine Tool Building Plant of the "Soyuzstankoprom" All-Union Production Association. This section is a model of production of the future five-year plan period, the tomorrow of machinebuilding in our republic. Here are installed new in principle systems of metalworking equipment -- groups of NC machine tools of domestic manufacture for turning, milling and drilling parts. "Our plant," stated B. Vasilchuk, assistant chief engineer, "manufactures mortizing machines used by all the machinebuilding sectors in the country. At present, an improved model of the machine tool is being prepared for production and certification for the highest category of quality. It will meet the highest modern requirements. A cardinal reequipment of the plant will create the required conditions for the manufacture of the model. Its units require higher precision of machining which can be done only with NC machine tools. Twelve such machine tools have been installed in the shop, nine of them are already in operation and nine are undergoing start-up and adjustment work by installers from the Lipetsk Machine Tool Building Plant. Plant cadres have already been trained in Lipetsk in adjustment and electronics... In the very near future, there will be created here three machining centers for manufacturing housing parts for machine tools, each one of which will free not less than three workers and increase the productivity of labor by 30 to 50 percent. The center will "lock" into a single technological complex the operations of milling, threading, rough and finishing boring, etc. [By N. Aliyev] [Text] [Baku VYSHKA in Russian 27 Aug 85 p 1] 2291

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ROBOTICS

OVERVIEW OF LITERATURE, RESEARCH ON INDUSTRIAL ROBOTS

Kiev TEKHNOLOGIYA I ORGANIZATSIYA PROIZVODSTVA in Russian No 3, July-Sept 85 pp 1-3

[Article by G.A. Spynu, doctor of technological sciences, and V.A. Chumakov, engineer: "The Modern Level and Potential for Development of Industrial Robots"]

[Text] In the basic trends for the economic and social development of the USSR for the years 1981-1985 and for the period up to 1990 that were adopted by the 26th CPSU Congress, it is noted that the broad application of industrial robots and the establishment of flexible automated production systems are one of the most urgent national economic tasks.

At the present time in the USSR, lot production of industrial robots has been imposed on the enterprises of Minstankoprom, Minpribor and others.

In the catalog "Modern Industrial Robots" (Moscow, 1982), more than 270 models of industrial robots for various technological purposes are listed, including 87 models produced in our country.

Publication of a catalog of industrial robots produced by SEV [Council of Economic Interdependence] member-countries facilitates the coordination of the work that is being conducted in countries of socialist cooperation in the area of development of a unified standard-size series of robots, as well as that of SEV standards that establish terminology, designations and basic technical indices for industrial robots. This will allow a reduction in the parallelism of national developments, as well as the development of a complex of specific measures for the establishment of compatible systems of unit-module construction for industrial robots in SEV member-countries and the further specialization of production of robots and component parts.

In the USSR, alongside monographs and various articles, a large quantity of special methodological literature has been published. To their number should be added the above-mentioned catalog, "Automated Technical Complexes "Equipment--Robot" [as published] (Moscow, 1981), "Testing Industrial Robots: Methodological Recommendations" (Moscow, 1983), "Instructions for Evaluating the Economic Efficiency of Setting up and Using Automated Manipulators with Programmed Control (Industrial Robots)" (Moscow, 1983), GOST [State All-Union Standard] 25685-83 and GOST 25686-83 "Terminology and Definition: Classification", GOST 24836-81 "Programmed Control Facility for Industrial Robots: Coding and Programming Methods" and others.

Since the beginning of the 11th Five-Year Plan, a large quantity of industrial robots has been produced in the USSR; in 1983 alone 10,700 units were produced, and in 1984--13,700 units. For the UkSSR, figures for these years are 1400 and 1600 units respectively. These figures bear up the fact that our industry is coping successfully with the set tasks. In subsequent years production of the given type of equipment will increase.

Industrial robots are constantly being improved. The quantity of manipulators with lever (anthropomorphic) design is increasing, and wave reduction gears and ball pairs are being adopted, which allows a significant increase in the precision of positioning; a growing number of robots is equipped with electromechanical drive, which has significant advantages over other drive types.

An important trend is the design of facilities for controlling industrial robots on the basis of modern microprocessor technology. This will permit the expansion of the functional resources of robots, an increase in the reliability of their operation and a reduction in the size of control facilities.

Complexes and lines using robot technology are being instituted on an ever wider basis. The design of robotized complexes--of modules for flexible automated production-- is a basic trend in the development of robot technology. The application of such complexes requires serious preparation of the industry, execution of technological and design operations and sometimes significant reorganization of production.

The development of robot technology and robot engineering in our country is given a great deal of attention. The application of robots in enterprises is an important step toward automating technological processes. In 1980, under the Kiev gorkom of the Communist Party of the Ukraine, a scientific-methodological council on robots and manipulators was set up; it is conducting a large scientific-organizational project.

As of January 1, 1984, 787 industrial robots and manipulators were in operation in Kiev, and the economic effect achieved comprised 360,000 rubles; in 1984 about 700 more units were installed. Robots are used in stamping and electroplating production, mechanical processing, in the manufacture of printed circuit boards and sheets of plastic, assembly and other processes.

The best results in the robotization of technological processes and the design and implementation of robot-technology complexes have been achieved in the PO's [Production Associations] Kommunist, Elektronmash, Tochelektropribor, Kievskiy radiozavod and others.

A "coordinated plan for the scientific-research and experimental-design operations of the Academy of Sciences of the Ukranian SSR in the design of robots and robot-technology systems" was prepared at the end of 1981 and approved at the beginning of 1982. This plan permitted the regulation of NIR [Scientific-Research Operations] and OKR [Experimental-Design Operations] and the determination of which had most potential for the years 1981-1985.

The Institute of Electric Welding imeni Ye.O. Paton of the AN UkSSR [Ukranian SSR Academy of Sciences] began operations on the development of industrial robots for

welding in 1970. In the past few years the IES-690, the USSR's first robot for resistance spot welding, and a robot-technology complex for arc welding on the basis of the Universal-15M manipulator have been designed, and interesting NIR and OKR have been conducted. At the present time the institute is working on a robot-technology complex for arc welding based on the general industrial robot TUR-10.

The AN UkSSR Institute of Cybernetics imeni V.M. Glushkov has obtained significant scientific results in the area of sensitizing robots. The problem of designing adaptive robots is one of the most important in robot technology.

Scientific-technical and experimental-design operations are being conducted intensively at the Kiev Institute of Automation under Minpribor, where the territorial center of robotization is operating successfully.

Robot technology is being widely implemented at Minpribor enterprises. Thus, in 1983 alone, 311 robots have been installed at 7 plants. The Minavtoprom branch institute of robotization--NIIRavtoprom--is located in Kiev.

A large operation in cadre training is being carried out. Since 1981 the department of technological cybernetics at Kiev Polytechnical Institute has been training engineers in the specialty of "robot-technical systems". In the mechanical department of KPI [Kiev Polytechnical Institute] over the course of five years courses are being given in "industrial robots" and "robotization of machine-engineering enterprises".

Along with the achievements in the area of robotization of production, there are also certain insufficiencies. Thus, in a number of enterprises industrial robots are being implemented slowly and uncertainly. It is obvious that one or two robots at an enterprise cannot give any noticeable effect. It is necessary to switch to a broad application of robots and robot-technology complexes. At certain enterprises the robots that have been installed are being operated poorly and are not included in the production process. Individual enterprise directors are underestimating the role and significance of robot technology.

Up to now there is still imprecision in terminology. Thus, at certain plants transfer arms are also turning up in lists of the number of industrial robots.

A new GOST and a number of methodological guides that have been published allow the precise definition of certain concepts of robot technology.

The basic trends in the development of industrial robots are:

widespread development of operations for the conversion of robot-control facilities to a modern design-element basis--microprocessors. This will allow the reliability of robots to be increased significantly and their cost in lot production to be reduced;

scientific-research and experimental-design operations being conducted in the development of robot-technology complexes--modules for flexible automated production; here the leading experience accumulated in the country should be used;

robotization not only of technological processes proper, but also of transport-warehouse operations;

development and design of adaptive robots that can change programs when conditions in the external environment change.

The execution of corresponding NIR and OKR as well as constant attention to the problem of robotization will allow the achievement of good results in the automation of production processes and the economy of material and labor resources.

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ROBOTICS

BRIEFS

ROBOTS AT LIDSKIY PLANT--Robots have replaced workers in the stamping shop of the Lidskiy Electrical Products Plant, where 40- and 100-ton presses are installed. They freed six stamping workers from heavy monotonous labor. Labor productivity increased three-fold. With the help of the VPO [All-Union Production Association] Soyuzelektrosvet, the enterprise set up a long-term program of cooperation with the field's leading NII [Scientific-Research Institutes] as well as with the Novocherkassk Machine-Engineering Plant. In the next five-year plan the stamping and plastic processing shops will get 10 more robots. And before the end of this year modern equipment will be installed on the painting line, freeing 12 people from dangerous work. [Text] [Minsk NARODNOYE KHOZYAYSTVO BELORUSSII in Russian No 8, Aug 85 p 3] COPYRIGHT: "Narodnoye khozyaystvo Belorussii", 8, 1985.] 12461

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